Utilization of Spaceborne Passive Microwave Data (SMMR, TMI, and AMSR) for Soil Moisture Sensing

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Abstract

The SMMR, TMI, and AMSR are spaceborne passive microwave sensors that have dual-polarized channels at frequencies of 10.7 GHz or lower. Although these instruments have coarse spatial resolutions (25-150 km) they can observe soil moisture variability through low vegetation cover, and offer the best potential yet for observing seasonal and interannual trends of large-area soil moisture. SMMR data from 1978-87, TMI data from 1997 on, and AMSR data starting in 2000 are and will be available for such studies. To facilitate these investigations, earth-gridded data sets of multichannel brightness temperatures from these sensors are being generated. These data sets allow the land-surface signatures from the different sensors to be intercompared and calibrated, and the effects of differing spatial resolutions to be evaluated. Ancillary data sets of surface topography, soil texture, vegetation cover, and surface temperature are also being processed on the same grid to aid in the estimation of soil moisture. Results of intercomparisons and trends using the SMMR and TMI data will be presented, with a review of the expected improvements in soil moisture estimation using AMSR data when they become available. The brightness temperature polarization difference, and its variability, are indicators of vegetation amount that can be effectively utilized in soil moisture retrievals. Measurements using airborne radiometers at 1.4 and 2.7 GHz together with TMI data at 10.7 GHz will be shown to illustrate this approach.